IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Confirmation No: 2169
	)	
WAYNE, Frank David	)	Examiner :
	)	F. Campanell
App. No.: 10/511,337	)	
	)	
Filing Date: October 15, 2004	)	
	)	
METHOD OF CONTROLLING LUBRICANT	)	
PROPERTIES BY MEANS OF DILUTING THE SAME	)	07 July 2008

COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF F. DAVID WAYNE

I, David Wayne, declare as follows:

My name is David Wayne. I am presently a Senior Scientist for Shell Global Solutions Inc. (UK) and the named inventor on the above-referenced patent application. I am more than 18 years of age, have not been convicted of a felony or a crime of moral turpitude, am of sound mind, and am competent to make this Declaration.

I have conducted research and development in the field of base oils for lubricants and traction fluids and lubricant manufacturing for 22 years.

I have reviewed WO 96/11244 owned by Mobil, US patent 3966624 to Duling, and US patent 5962381 to Bovington. I have also reviewed the outstanding Office Action in this case, in which the Examiner rejects the present application over the combination of these references.

In the Office Action, the Examiner rejects the present claims as obvious over the combination of Duling, which discloses altering properties of a fluid by adding another miscible component, which might be regarded as a miscible diluent, but does not disclose reversible dilution in a vehicle, and the Mobil '244 publication, which indicates that distillation is a possible, but not preferred method of separation for a component added to an ingredient mixture in a vehicle.

Because the present invention depends on separation by distillation (in a vehicle, or in a machine that is lubricated or that employs a working fluid such as pressure-transfer liquid) of a fluid from a mixture, the use of a volatile fluid consisting of small molecules is an inescapable part of Applicant's scheme. The use of such a volatile component in a formulated lubricant is <u>directly contrary</u> to normal practices in lubricant formulation.

For example, Duling repeatedly stresses the need to use components of high boiling point to avoid the loss of some part of the liquid mixture by evaporation. Likewise, in the context of contemporary formulations of engine lubricants, the Noack test is often used as a specification both in Industry Standards and by individual equipment manufacturers when they consider granting an approval to a product for use in their equipment.

The Noack test determines the percentage of the oil's initial volume that is lost by evaporation when the oil is maintained for a period of time (1 hour) at an elevated temperature (250°C) in a flowing gas. For heavy-duty oils, for example, the European specifications stipulate that the Noack evaporative loss should not exceed 13%. The aim of base oil production technology for many years past has been to <u>reduce</u> the Noack loss as far as possible: in some base oils it is now as low as 6%. Such low evaporative losses could not possibly be achieved if the lubricant contained a volatile diluent. Thus, it was far from obvious that such a component would be acceptable in any usage.

The use of a relatively volatile diluent is essential if distillation is to be effected in the lubricated machine, sufficiently quickly to allow the composition of the managed lubricant to be altered so as to keep up with changing conditions in the lubricated machine. The very high temperatures, very low pressures and specialized equipment used in research laboratories or in the manufacturing of base oils, could not be employed in the confined spaces of the engine compartments of vehicles or mobile hydraulic excavators.

When I conceived of the present invention, it was not obvious to the industry that the invention could be put into practice. As evidence of this fact, I would point out that Duling is one of several hundred publications, appearing both before and especially after Duling, that have attempted to use techniques similar to Duling's to develop a satisfactory traction fluid. Such a fluid would need to possess high traction over a wide temperature range, but most especially at the warm operating temperature of the traction drive (typically between 100 and 150°C) while simultaneously possessing a sufficiently low viscosity at low starting temperatures, perhaps –40°C. These efforts, extending over 35 years or more, have not succeeded. No fluid has been found that can perform satisfactorily over the required temperature range of the North American climate, for example.

In 1999 the Japanese motor vehicle manufacturer Nissan launched two vehicles that employed a traction drive transmission developed and manufactured by their transmission manufacturer Jatco. Those vehicles employed a traction fluid of fixed

composition that possessed quite high traction at high temperature, but that was too viscous to allow a cold start at low ambient temperatures. The vehicles were only sold on the central and southern islands of Japan where low temperatures are rarely encountered. Applicant was given to understand that the vehicles were not sold on Hokkaido because of its low winter temperatures. Applicant has further been given to understand by business contacts in Jatco that the withdrawal of the vehicles from the market after a few years occurred because it was recognized that the properties of the traction fluid used would not allow the vehicles to be sold more widely, and certainly not on the North American continent.

The story of Nissan's efforts is evidence both of the failure of orthodox development to provide a satisfactory lubricant for this application, and of the fact that our claimed scheme of controlling traction and viscosity by reversible dilution, was not obvious, even several years after the publication of the '244 reference.

Similarly, the fact that the concepts underlying the present claims have been discussed with these manufacturers and others and agreements for joint development are being discussed with companies developing traction drives and hydraulically-operated construction equipment, is evidence that the claimed technology is appreciated within the industry.

When I first conceived the concept of controlling fluid properties by reversible dilution, it was not at all clear that the objective could be achieved. It was obvious that viscosity alone could be controlled by reversibly adding a low-viscosity, volatile diluent as the temperature of the lubricant fell. It seemed much less likely that the traction coefficient could be kept nearly constant. In a fluid of fixed composition, the traction coefficient varies quite strongly with temperature, typically falling to low values above and below a maximum at some intermediate temperature.

If a liquid is to possess a high traction at a certain temperature, then at that temperature it must have both a high rate of increase of viscosity with pressure, and a high limiting shear stress. The molecular structures and interactions that give rise to high limiting shear stress are not well understood, and it is quite common to find unexpected effects when blending liquids of different or similar traction properties. For example, I know of cases where a mixture of two high-traction fluids exhibits much lower traction than either of the components separately.

It seemed most likely that mixing a low-viscosity fluid consisting of small molecules, into traction fluids that generally contain much larger molecules, would rapidly reduce the traction coefficient of the mixture as the proportion of the low-viscosity diluent increased. My experimental investigations confirmed that this is indeed so in most cases.

However, it was surprisingly found after investigations extending over several months, that certain specific combinations of base or resident fluid (possessing high traction at high temperature) and diluent did enable the traction to be maintained at a high value

(Example 1 in our application) while simultaneously allowing the change in viscosity with temperature to be so greatly reduced as to cease to be the insuperable problem that it is in fixed-composition fluids.

I know of a very few combinations that will work for traction fluids (and of many others that will not). I therefore believe that the scheme proposed in my application provides a potential solution to a long-standing problem that has seriously impeded the adoption of the traction drive as a vehicle transmission. (The tractions drive can offer gains in fuel economy of 10 to 20% over orthodox automatic fixed-ratio gearboxes and would arguably be adopted if certain fluid-related issues could be overcome).

As the inventor of the present invention, I received many statements from colleagues indicating that they did not expect that I could make this invention work. By discovering specific combinations of resident fluid and diluent, I was able to solve a problem that had not been solved before and that others with my skill level did not think could be solved.

I am aware that willful false statements and the like are punishable by fine or imprisonment, or both under Title 18 U.S.C. §1001 and may jeopardize the validity of the application or any patent issuing hereon. All statements made herein are made based on my own knowledge are true and that all statements made on information and belief are believed to be true.

David Wayne

/F. David Wayne/

Date: 4th August 2008